FAA GENERAL AVIATION NEWS

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CONTENTS/July 1977

3 Power Off

6 Wings over Canada

10 Downside Up

13 Briefs

14 News Log: Taped Radar Returns Aid Search for Missing Aircraft . . . Engine Regulations to be Reviewed . . . Centers Use Split Channels for High Altitude Aircraft . . . Scientific Publications . . . Student Pilot Guide . . . ATP Helicopter Guide

15 Flight Forum

Looking for trouble Page 10

Oshkosh smoke signals Page 13

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SHOULD READ ISSUE 3

POWER OFF

An inquiry into the cause and prevention of engine failure accidents

Charles Lindbergh's epic 3,600 miles nonstop flight to Paris proved, among other things, the remarkable durability of the contemporary aircraft engine. Today, after fifty years of aviation progress, aircraft engines are infinitely lighter, stronger, quieter, and still more reliable. Then how is it that when you examine the statistics of general aviation accidents published by the National Transportation Safety Board, the leading type is *engine failure* or *malfunction?*

Did Lindbergh, or his engine manufacturer, know something about engines in 1927 that we do not know?

Are our engines being abused by nonmechanically oriented amateur pilots? Has the quality control of the manufacturers fallen? Are there inherent design problems? Are maintenance standards sufficiently high? What can the individual pilot/owner do to lessen his chances of becoming involved in a power failure accident?

To find some answers to these questions FAA's General Aviation Division, Flight Standard Service, has conducted a review of engine failure accident briefs, as complied by the National Transportation Safety Board.

The NTSB statistics show "engine failure or malfunction" as the leading *type* of accident for the past decade, with a small but persistent rise in the number of such accidents compared with other types of accidents. In 1975, the latest year for which complete figures are available, NTSB (in the Annual Review of Aircraft Accidents) states that engine failure or malfunction as a *type of accident* accounted for nearly one-fourth of all general aviation accidents (1,031 out of 4,237 total accidents). This is far more than any other type of accident.

However, it should be observed that when the NTSB uses the expression "engine failure as a type of accident," it refers to any accident in which the power from an engine was interrupted for any reason whatever (including engine-out simulation). This would include not only mechanical failure and pilot induced malfunction. but also simple fuel exhaustion (no fuel remaining on board the aircraft) which alone accounted

The total aircraft engine maintenance picture includes painstaking trouble-shooting, careful choice of parts, precise installation and inspection, followed by appropriate logbook entries. Neglect of any facet can lead to trouble—and there are accident figures to prove it.

for some 215 accidents in 1975.

For the FAA study, a specific listing was requested to cover all general aviation accidents in which engine failure was cited as the *probable cause*. These figures included propeller component failures, as well as accidents resulting from pilot error or improper maintenance, such as fuel starvation (fuel on board but not presented to the engine). However, fuel *exhaustion*, as a result of carrying insufficient fuel to complete the flight, was excluded. In a three year period, 1973-1975, there were 1,694 accidents so defined; 535 in 1975 alone.

(Note that many aircraft were landed without damage following an engine failure, so that the total number of instances of inflight engine failure is not known but must be presumed to be substantially greater than 535. In many accidents a secondary factor was involved, which led to the pilot's inability to make a safe emergency landing, such as overloading, bad weather, inattention to the terrain or flight path, poor judgement, and lack of practice in emergency procedures. But in any case engine failure was the first cause in the chain of circumstances which culminated in the accident.)

In reviewing these 535 accidents in 1975 in which engine failure was cited as a probable cause, FAA researchers established four convenient categories: accidents caused by (1) pilot error, (2) maintenance error, (3) material failure and (4) undetermined cause.

Pilot error is the smallest of these divisions, accounting for only 61 accidents. All but 10 of these problems originated on the ground, either during the preflight check of the aircraft, or during the ground run-up. In many instances the pilot simply did not make a thorough examination of the aircraft or the fuel. For example, there were six cases of contaminated fuel leading to engine failure, and seven cases of blocked fuel vents leading to inflight fuel starvation. Fouled spark plugs caused another ten aircraft to crash. In all of these cases, the investigators believed that the deficiency was detectable by an alert pilot during normal required and approved preflight check procedures.

In some cases it is clear that the pilot *was* aware of an engine deficiency but nevertheless decided to carry out his planned flight. One tragic example involved an air taxi operation in a medium twin, which lost an engine at a low altitude. During the forced landing the airplane struck power lines and crashed, bursting into flames. Two persons on board died. The NTSB report

stated that failure of the connecting rods was the probable cause of the accident, but noted that the pilot/operator was aware, prior to the flight, that the maintenance on this airplane was substandard.

The pilot's responsibility in a case like this is clearly defined in the Federal Aviation Regulations (91.29), which require him to ascertain, by all reasonable means, that an aircraft is airworthy; and not to fly one which he has reason to suspect is nonairworthy in any respect. The pilot who flies an airplane with known deficiencies is in violation of the regulations, regardless of how the deficiency came about, or who performed the maintenance.

Inflight pilot errors leading to engine failure are rather few—at least, in the study count for 1975 only ten are listed. The failures proceeded either from the pilot's lack of familiarity with required procedures at some phase of flight, or from a deliberate disregard of established safe operating procedures—sometimes associated with alcoholic impairment of judgment. An example of a mishandled engine involved a DSK-1 *Hawk*, (a home built aircraft) which was held in a maximum performance climb angle (estimated at 50 to 55 degrees) for a prolonged period until the engine overheated and stopped, leading to a fatal crash. Obviously it is not possible to build an aircraft engine which is immune to abuse of this kind. Apparently the most common inflight error leading to engine failure is improper handling of carburetor heat.

Pilot-induced engine failure accidents, stemming from errors committed on the ground or in the air, all have one common factor: they are *preventable by the pilot* Conceivably, more fail-safe protective devices can be offered by the manufacturer to call attention to lapses in judgment or procedure—which would add to the cost of flying—but some degree of responsibility for the continued operation of his engine will always remain with the pilot—unless he is automated out of the cockpit.

Maintenance error. About one fourth of the engine failure accidents examined by FAA for 1975 (125 out of a total of 535) can be described as mechanical failure due to *improper or insufficient maintenance*. The cause of a mechanical failure cannot always be determined with certainty, so that it is possible there was pilot involvement in some of the accidents blamed on maintenance. Interestingly, there was no particular part or component or system of the engine which figured conspicuously in the engine failures. For the most part the investigators traced the problem to simple human inattention to details.—to the selection of the wrong part, ot faulty installation, to over-torqueing or under-torqueing, to failure to replace or safety-wire parts, to contamination of bearings, to kinked lines, to disconnected throttle or control linkage, etc., etc.

There are literally thousands of parts to an aircraft engine; the single mishandling of many of them could bring about an accident. The investigation of one fatal accident in 1975, following failure of one cylinder, disclosed that a small screw had been inadvertently left in the combustion chamber in the course of the engine overhaul. Two persons paid with their lives for this mistake.

Material failure. There are in this category 156 accidents involving mechanical failure of the engine which could not be traced to faulty maintenance—where a part failed short of its normal expected life use for no apparent reason. In some of these cases the investigators felt that improper maintenance as a cause factor was quite *probable*, but were unable to find any evidence. In other cases, maintenance was clearly not a factor, since the aircraft was newly acquired from the factory, or no recent work had been performed that could have affected the area of the engine where the failure occurred.

In only two cases was design failure cited by investigators as a cause, and neither concerned type-certificated aircraft. One involved a homebuilt aircraft with an inadequately designed fuel selector, and the other was a restored vintage aircraft with an inadequate lubricating system.

	Accidents	*Fatals*	*Fatalities*
1. Pilot Error			
a. Pre-flight	51	5	17
b. Inflight	10	2	2
2. Maintenance	125	8	15
3. Material Failure	156	5	6
4. Undetermined	193	13	29
Total	535	33	69

Two of the 156 material failure accidents involved improper factory installation of type certificated aircraft. In one case the oil inlet hose was incorrectly positioned, leading to an inflight fire after the aircraft was delivered, and a fatal crash. In the second case the fuel vapor return line check-valve was found to have been installed backwards, resulting in fuel starvation inflight and an off-airport near-fatal crash.

For 1975 that leaves 152 engine failure accidents in the mechanical failure category with *no known cause*. Engineers are reluctant to accept the idea that an engine part, manufactured and installed in accordance with an approved design and with no apparent material flaws, could fail short of its expected useful lifespan—with no contributing factors. It may be significant to note that in these cases there was indeed a conspicuous bunching of failed parts: there were, for example, 19 cases of connecting rod failure, 15 cases of valve assembly breakdown, 14 cases of broken crankshafts, and 12 cases of cylinder failure.

If the maintenance and the operation of the engine was carried out in the approved manner, does this imply something is lacking in the design standard? Or is it possible that our present methods of investigating accidents with engine failure are inadequate to the task of learning the precise reason for failure?

The third and final category of engine failure accidents to be considered comprise the 193 accidents in 1975 with undetermined cause. In this grouping, investigators were able to learn only that the flight had been terminated prematurely by engine failure, but they were unable to determine which parts failed.

At first glance it might appear that 193 accidents are an extremely large number to be listed simply as "Engine failure—cause undetermined". But the figures become understandable when you see the problems confronting these investigations. In many cases the engines were so badly destroyed by fire or impact that not enough material remained to be examined intelligently. In other cases the engines were simply never recovered—the aircraft sank in very deep or difficult waters, or disappeared in desolate country. Even where the engine *could* be examined, investigators frequently were unable to obtain any hint of how the problem developed from the crew, because of the large number of fatalities in this category (13 fatal accidents, 29 fatalities).

If more information were available, some of these accidents very likely would be reassigned to pilot inflight error, of which, as noted earlier, there are only 10 substantiated cases out of 514 accidents. Some investigators regard this as a suspiciously low figure, but are reluctant to assign responsibility to the pilot on the basis of suggestive evidence alone. And finally, there are always practical considerations which limit the total investigative time and expense that can be devoted to any one accident.

Indeed, aircraft accidents are given far more investigative attention than any other form of private transportation, which is one reason why general aviation has such an excellent and steadily improving safety record. Nevertheless, the increasing predominance of aircraft engine failure accidents in recent years merits the attention of everyone involved in aviation, whether in the cockpit, the repair shop, or in the factory. The better the performance of modern aircraft engines, the greater the cost of negligence.

(The second article in this series in the August issue, will explore lesser known causes of engine failure that can be observed in the preflight check.) ■

Wings over Canada

Flying to Alaska from the "Lower 48" in a small plane is, for many general aviation pilots, the adventure of a lifetime. Increasing numbers of pilots have been making the journey in recent years, especially since the completion of the Alcan Highway which serves as a helpful guidepath for VFR flight, and can be used for emergency landings. The Canadians are happy to have U.S. aircraft flying over their territory en route to Alaska, but they feel that many of the accidents that have occurred could be avoided if the conditions of flight in Canada were better understood.

In the two year period 1975 through 1976, a total of 27 U.S. registered light planes, bound to or from Alaska, crashed in Canada, principally in British Columbia and the Yukon Territory, according to figures supplied by Transport Canada, the Canadian counterpart of our Department of Transportation. Ten of these accidents involved fatal or serious injuries. The prevailing cause of these serious accidents can be summed up in a single phrase: Lack of preparation for coping with the environment.

Pilots who have flown only within the United States are simply not prepared for the extreme contrasts of terrain and weather that may be encountered in northwest Canada, or for the dearth of human habitation or landmarks. "Sparsely settled" is the term used by Canadians to describe most of British Columbia and all of the Yukon, and in many areas it is an understatement. The average number of human beings encountered in this area is less than one person per square mile.

This compares to an average ratio of 60 persons per square mile for all of the United States. Consequently, the pilot who has the misfortune to crash land away from the settled areas could wander for weeks or even months without meeting a solitary person. Frosty nights, even in summer, and daytime predators, ranging from swarming insects to huge grizzly bears, could add to his distress.

Canadian officials recommend summer and early fall as the most favorable seasons for flying up to Alaska. In the late fall and winter, extreme cold (temperatures as low as 60 degrees below zero F. have been recorded in the Yukon) and heavy snows are serious deterrents. In the spring the weather may be pleasant but the many unpaved landing strips may prove difficult to negotiate.

The land mass confronting the Alaska bound pilot is a seemingly endless sprawl of mountains, some of which are permanently snow-capped. The highest mountains are along the coast, ranging up to nearly 20,000 feet near the Alaskan border. Inland there are countless river valleys, with streams flowing in all directions. The complexity of the mountain ranges makes it difficult for small aircraft to depend on VFR radio navigation; and most general aviation aircraft do not have the capability to fly IFR safely over this section of the country, where MEAs may be over 10,000′ ASL. The prevalence of cloud layers in the valleys during much of the year may oblige the VFR pilot to fly at relatively low altitudes, which limits his gliding (and radio transmission) range in the event of engine malfunction. The predominance of thick timber and uneven terrain underscores the problems of an emergency landing for the pilot who is unfamiliar with the area.

American pilots whose experience has been limited to the usual flying in the "Lower 48" may be totally unprepared for the flight environment they encounter north of the Canadian border. Key failings in this regard include:

- **Lack of pilotage experience.** The network of VOR NAVAIDS is so extensive in the United States that many U.S. pilots have never attempted to fly from one point to another unfamilar point depending only upon ground

reference and a chart. When such pilots head north into the sparsely settled areas of Canada, where it is possible to fly for a hundred miles without passing a town, the problem of staying on course can become critical. The problem is worsened by the use of an unfamilar chart, such as the Canadian aeronautical charts, and by the presence of an environment with few useful landmarks (for the uninitiated). Many of the routes follow waterways or river valleys which appear to have an infinite number of forks and junctions. One wrong turn can lead the unwary pilot into a maze of twisting valleys amid steep mountain slopes, and culminate in a box canyon or the floor of an overcast.

An American pilot, returning to Alaska alone via the Alcan Highway last summer, made a wrong turn up a valley in the Liard River sector, eventually ran out of fuel and crash landed in a wild, uninhabited area of the Yukon Territory. After nine days of blundering through woods and rafting down streams, he was fortunately spotted (over 100 miles from the search area) and rescued by a Canadian Search and Rescue aircraft. The pilot, virtually hysterical at the time of rescue, recounted a harrowing tale of being trailed by wolves and grizzly bears.

• **Lack of appropriate charts.** Apparently some American pilots are naive enough to imagine it is possible to find the way up to Alaska by simply following the shoreline or the roads, with the aid of a roadmap alone. This is an open invitation to disaster. The area north of the border is so vast and the terrain so varied that even pilots with adequate charts can get lost, attempting short cuts or mistaking a logging road for the graveled highway. To fly the overland route VFR to Alaska you should have at least a dozen Canadian aeronautical charts (similar to U.S. sectionals), or half a dozen WAC charts (which cover twice the area of the aeronauticals). You should also have the appropriate U.S. sectionals for Alaska, from Ketchikan to Fairbanks, and you should study the Alaska Supplement to the Airman's Information Manual for required equipment and supplies, recommended procedures and advice.

VFR pilots should also have on board the Canadian VFR Chart Supplement, which updates the aeronauticals every 112 days. The Supplement also contains a complete listing of airports south of 60° N. Latitude, (the Northern Supplement contains the remainder) with sketches and summary details; and a wealth of other information on flight procedures, restrictions and hazards to flying in Canada. Terminal area charts are needed by pilots flying into or near the major cities (Vancouver and Calgary, for example), and floatplane pilots should have the Canada Air Pilot Water Aerodrome Supplement.

Canada-bound IFR pilots should carry the IFR Chart Supplement as well as en route and instrument approach charts. IFR qualified pilots should have the approach charts even though they do not plan to file IFR, since a change in the weather may require an instrument landing. Canadian air traffic officials are repeatedly troubled by American pilots asking for radar monitoring, in IFR conditions, to an airport for which they have no approach plates on board. In fact, Canada has announced officially that this year visitors to the Abbotsford Air Show (near Vancouver) will not be allowed to land in IFR conditions without the appropriate charts.

"Air Tourist Information Canada" is an excellent introductory booklet for visiting pilots, available free from Civil Aeronautics, Transport Canada, Ottawa, Canada, KIA0N8. For air travelers in British Columbia a very useful planning chart, the "Air Facilities Map" is available free from the British Columbia Aviation Council, International Airport, South, Vancouver, B.C., Canada V7B IA3. Ask also for the supplementary "VFR Flyways". Favored routes, airports, terrain features and pertinent aeronautical charts are identified.

• **Lack of familiarity with local or isolated landing strips.** Many of these strips have significant restrictions or terrain problems which can easily lead the uninitiated pilot to trouble on landing or takeoff. In remote areas the strips may be without radio service, and pilots who have not been thoroughly briefed in advance by the nearest ground facility may be unsure of such problems as local turbulence, flooding, landslides, runway slope, etc. A recent accident at Barkersville, in central British Columbia, involved a fourplace aircraft attempting to take off fully loaded from a strip with a pronounced but not readily apparent upgrade. The aircraft apparently just managed to become airborne at the end of the runway, but failed to clear the load on a logging truck that unfortunately was traveling on the road that circled the strip. The airplane cartwheeled in the air and slammed into a river bank, killing all four persons on board. Overloading is a frequently cited cause of accidents involving aircraft heavily laden with recreational gear, fishing catch, trophies, etc. as well as passengers.

• **Unfamiliarity with non-directional beacons.** Beacons are used much more commonly in Canada than in the United States, where many pilots have no experience with them at all. If they fly into Canada without an appropriate receiver, they are severely handicapped. Some Canadian airports, especially those surrounded by high terrain, have two or even three nondirectional beacons, used to help VFR traffic avoid collisions with adjoining mountain slopes as well as for instrument approaches. In some areas, ruggedness of terrain and remoteness of location make the installation of an OMNI range prohibitively expensive. An ADF (Automatic Direction Finder) is an extremely important piece of safety equipment for aircraft flying over northern Canada, and pilots who are not familiar with its usage should make a point of practicing non-directional beacon navigation before they cross the border.

A recent accident near Victoria, B.C. involved an American pilot making an instrument approach to that airport after departing Seattle. The pilot was informed en route that the Victoria VOR was out of service, and advised to proceed to the beacon located southeast of the airport. Apparently he tuned in instead to another beacon located *northwest* of Victoria, so that when he was cleared for the approach and proceeded in a westerly direction where he believed the airport to be, he was unable to locate the airport and eventually, in very poor weather, collided with a hillside near Shawnigan Lake. It was a fatal crash.

• **Unfamiliarity with Canadian flight rules.** Air traffic and flight operation rules are basically the same in Canada as in the United States, but there are some significant differences which many American pilots appear to ignore. These include:

1. *Uncontrolled VFR flight "on top" (above an overcast) is not permitted. Controlled VFR* (CVFR) is a flight conducted under visual flight rules within Block Airspace, in accordance with an air traffic control clearance, and requires that the pilot have a U.S. instrument rating or a Canadian endorsement. Block Air-

space is the airspace within designated airways, extending up from 9,500 feet ASL (12,500 feet above ASL west of longitude 114° West). Canadian air carrier pilots have reported a number of near midair collisions with U.S. planes in Block Airspace. CVFR aircraft must depart the airway without descending or climbing.

2. *VFR flight levels.* In Canada VFR aircraft at or above 3,000 feet ASL fly at odd or even thousand feet levels, according to heading (not at thousands plus 500).

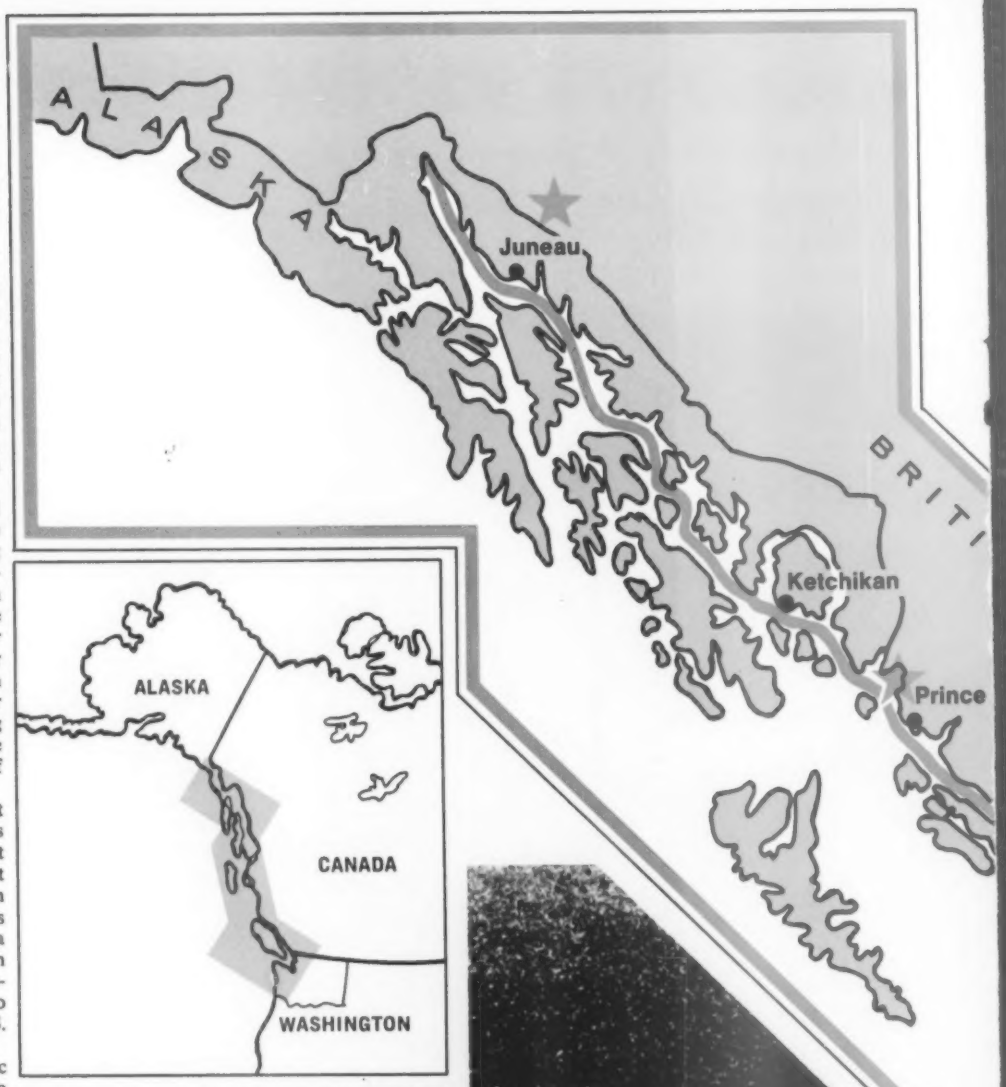
3. *A flight plan or flight notification is mandatory for most operations.* The flight *notification* form is used when the destination is in a remote location where closing a flight *plan* would be difficult for lack of communications. The pilot designates a responsible person who will notify air traffic control that an aircraft is overdue if it is not heard from within 24 hours after an agreed upon time—whereupon a search and rescue effort will be launched. A search is activated *one* hour after a flight plan closure is overdue.

Canadian officials are especially concerned about American pilots failing to observe the flight plan/notification requirement when flying into sparsely settled country. They are frequently besieged with telephone calls from relatives in the States seeking an overdue spouse, with only scanty information to offer searchers ". . . a red airplane, I think, or maybe red and blue . . . I'm not sure which kind . . . no, I don't know the number or exactly where he was going, some big fishing lake, you must know it, near the Alaska line . . ." Not much to go on, in the vast area of northwestern Canada.

On the other hand, *failing to close* a flight plan or notification produces a tremendous amount of wasted search effort which is not only costly and wearing on personnel but could jeopardize the safety of downed airmen in urgent need of rescue—if their rescue is delayed because search planes are out on a false alarm. Incidentally, filing a flight plan before crossing the border (in either direction) is also mandatory. Failure to do so could put the Mounties on your trail, or U.S. Customs authorities.

• **Lack of adequate survival gear.** Specific equipment and rations are required in Canada for all flights within the designated sparsely settled areas, which includes more than 90 percent of the country. Required items are: sleeping bag, flashlight, pocket compass, axe, matches in waterproof container, insect lotion, rifle and ammunition (no small arms), five pounds of concentrated food per person, cooking utensils, hunting knife, mosquito nets, fishing tackle, and snare wire. Alaskan requirements for incoming airmen are similar except that food *sufficient for two weeks* per person is required, plus a first aid kit, a fishing net, and two signaling devices in sealed containers. You may be asked about your survival gear when you file a flight plan, but the responsibility for having it on board is the pilot's.

Stories of prolonged human suffering from exposure and hunger, following forced landings in the north of Canada are legion. The rugged character of the mountains and the density of the forests has to be seen, to appreciate the hazard, which becomes evident only a few miles north of the U.S. border. Last October a small Canadian aircraft became lost in poor weather in a wooded narrow valley near Hope, B.C., and crash landed on a mountain slope less than 100 miles from Vancouver. The pilot, who was alone, survived the crash.



SELECTED CANADIAN CHARTS

VFR

Aeronautical Charts	$1.00 ea.
World Aeronautical Charts	1.50 ea.
VFR Terminal Area Charts	1.50 ea.

IFR

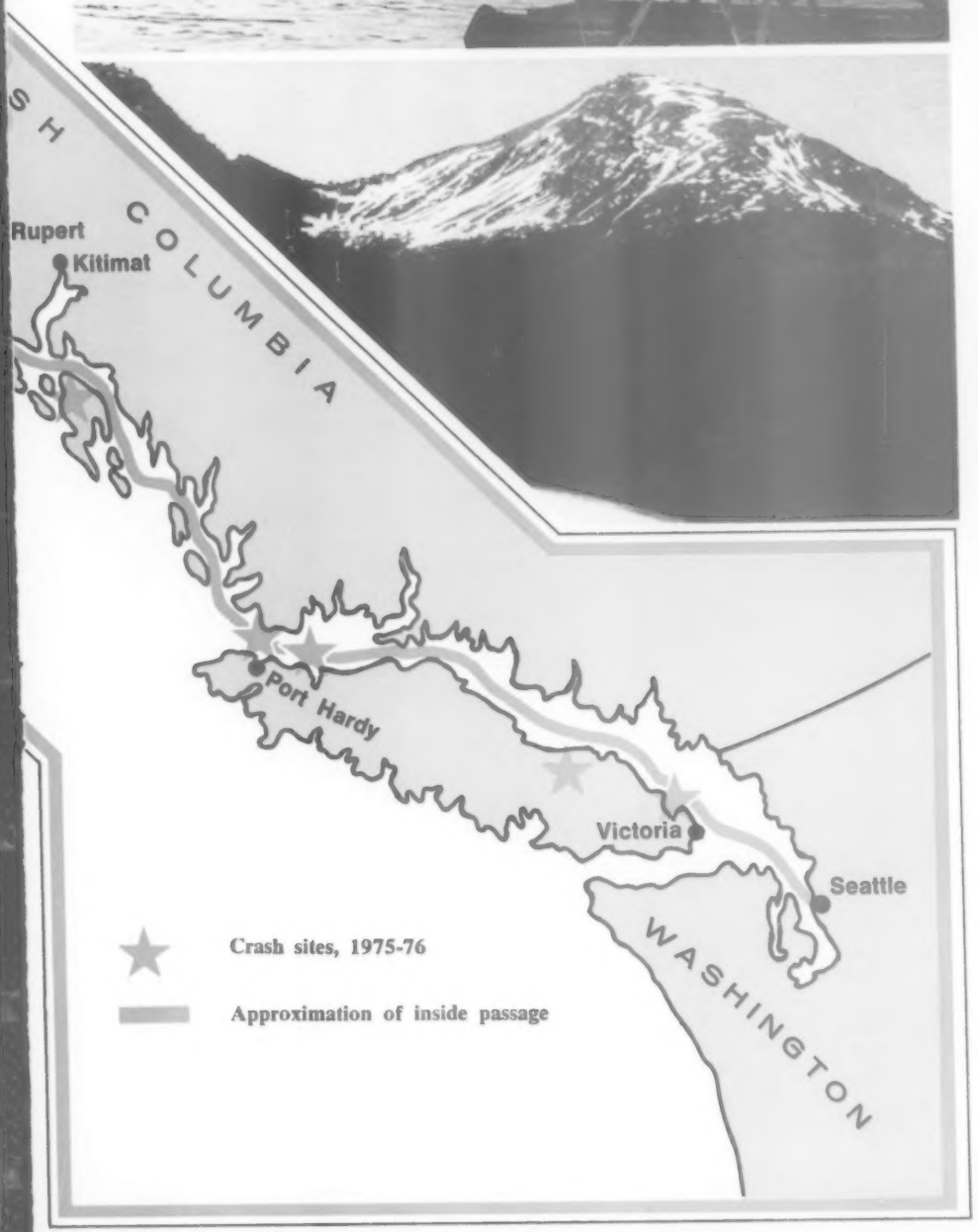
Enroute Low Altitude Charts (including Terminal Area Charts)	.30 ea.
Enroute High Altitude Charts	.30 ea.
Canada Air Pilot (Instrument Approach Procedures)	12.00 ann.

SUPPLEMENTAL INFORMATION

VFR Chart Supplement	1.25 ea.
Northern Supplement	1.00 ea.
Water Aerodrome Supplement	1.00 ea.
IFR Supplement	1.25 ea.
Flight Planning and Procedures	2.00 ea.

Charts and Supplements are available from:

Canada Map Office
615 Booth Street
Ottawa, Ontario K1A0E9 Canada



Clad only in a light business suit, he elected to walk out, following a stream toward what seemed to be the head of the valley. At this writing, no trace of him has been found, although the aircraft was located on the morning following the accident. There was no sleeping bag or other survival gear on board.

The fact that serious potential hazards exist, and certain procedures and regulations must be learned and observed, does not mean that flying over Canada to Alaska is necessarily dangerous or difficult. The rules exist to protect airmen and to assist them in dealing successfully with the environment. The pilot who takes the time to prepare adequately for his trip north, and refuses to be pressured by desires or demands leading to unsafe flight operations, should have no difficulty.

The first important decision is the route to be followed to Alaska. The shortest flight is directly up the Pacific coast of British Columbia, about 700 miles from Seattle to Ketchikan, on the lower end of the Alaskan "Panhandle". For light aircraft, most experienced pilots agree that this route can be flown safely only in seaplanes or floatplanes, piloted by airmen experienced in flying by reference to the ground and a chart, and having some knowledge of the area. They suggest that for your first trip you fly with a pilot already familiar with the route. The jagged coastline with its innumerable islets and inlets and fiords is one of the easiest places in the world to get lost, particularly when the sea fog obscures visibility—as it does most of the time.

The VFR flight path follows the shipping lanes, passing between Vancouver Island and the British Columbia mainland for about half of the journey north. After leaving Point Hardy the route proceeds along narrow winding passageways to Prince Rupert, a distance of about 300 miles without a single landplane airport.

The more favorable beaches for emergency landings are shown with wavy lines on WAC charts—also some cabin shelters. However, the shore terrain is always susceptible to change from landslides, flooding, winds, log jams, etc.

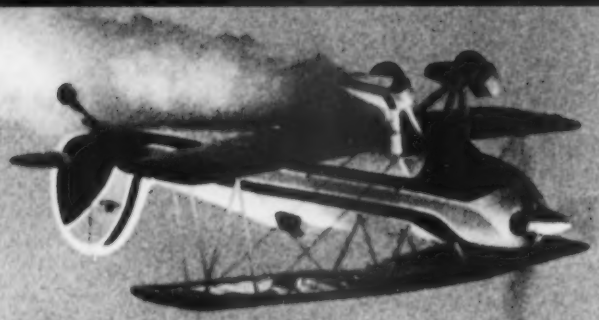
Weather forecasts for these areas are of limited value, owing to the changeability of local conditions. Pilots have to be prepared to turn back or put the plane down on the water on short notice. The latter decision frequently requires good seamanship to cope with swift currents, high tides and obstructions in the water. Getting the plane down may be only a small part of the problem; keeping it afloat may pose the major difficulty, especially when no wharf or protected cove is in sight. Adequate mooring equipment on board is a must.

Taxiing a floatplane at low speeds, while searching for an accessible beach and avoiding submerged obstructions, can overheat and ruin an engine in a short time. "Knowing the territory" from personal experience, plus advice from veteran local pilots, is the best safety cushion for flying the "Inside Passage."

Some Alaskan pilots who fly up and down the coast regularly use aircraft with minimal instrument panels, sometimes even foregoing gyro instruments, because of their unwillingness to depend on anything but their own eyes and their knowledge of the terrain below—flying close to the surface at all times, and putting the plane down whenever visibility becomes uncertain.

Exciting flying, but no place for beginners.

(Note: The second part of this article, in the next issue, will discuss overland routes to Alaska and Canadian air traffic services.)



Downside Up

(Second of a two-part article)

The flight originated from a small uncontrolled airport in sourthern Pennsylvania on a calm, clear afternoon. At the controls of the homebuilt blue and white Pitts *Special* was the airplane owner, a veteran pilot with more than 3,000 hours in his logbook. Purpose of the flight was to practice aerobatic maneuvers.

After takeoff he headed for a practice area, climbed to an altitude of about 3,500 feet above the ground and pulled the airplane into an inside loop, then leveled off at the top to do some inverted flying. At that point he estimated he was about 3,800 feet AGL and everything was normal (or as normal as possible when you are flying upside down) for the first few seconds. Then the airplane fell off to the right and went into a spin, inverted. For the first several turns the nose remained slightly down but then, in the words of the pilot, "The spin became faster, and flattened out to level. I applied power—on and off—with various combinations of stick and rudder, to no avail. After going through the whole procedure twice with no response I elected to abandon the aircraft."

The pilot figured he was no more than 500 feet above the ground when he bailed out, and only about 75 feet above the ground when his parachute opened. He landed unhurt in a farm barnyard about 30 feet from where the little Pitts smashed into the ground.

Investigators from the FAA Flight Standards District Office, who arrived shortly after the crash, failed to find any evidence of aircraft structural failure or control system malfunction that could have caused the Pitts to become uncontrollable.

In the course of the investigation the pilot was requested to compute a weight and balance for the airplane as it was when he took off. Results showed that aircraft weight, with full fuel, oil, pilot and parachute, was within the maximum gross weight limit of 1,050 pounds. However, *the center of gravity of the aircraft in that configuration turned out to be 1.34 inches aft of the rear C.G. limit.* The investigators considered the unbalanced condition to be a significant factor in the aircraft's going into the flat spin, and in the pilot's inability to recover from the spin.

The National Transportation Safety Board included as a probable cause of the accident, "Inadequate preflight preparation and planning; improperly loaded aircraft."

The key to this particular accident is the fact that the pilot was a large and heavy man whose weight nudged the C.G. just out of the envelope. The slightly out-of-balance Pitts *might* have been manageable for conservative, straight-and-level flying with gentle turns and no sudden attitude changes, (although this is not recommended) but when inverted and allowed to stall it went out of control.

The Pennsylvania accident, which fortunately ended without injury for the pilot, points up the importance of meticulous preflight planning for aerobatic flight.

Most veteran pilots believe that aerobatics, properly learned and practiced, make for more proficient, precise pilots. (A new FAA Advisory Circular on the subject of aerobatic flight lists "improving pilot proficiency and confidence" as a leading reason for the growing interest in the activity.) But the safety rules of flying and maintaining general aviation aircraft that are taught during conventionl pilot training assume a much greater importance, in terms of flight safety, in aerobatic operations because of the greater stress placed upon the airplane.

Acrobatic aircraft (see preceding article "Upside Down" in June issue for term definition) are not by regulation subject to any more stringent or frequent inspections than any other aircraft, but Bernard Geier, who heads up FAA's Flight Standards General Aviation Division, suggests that owners consider having acrobatic airplanes inspected more often than the annual requirement. Older airplanes particularly should be carefully scrutinized for airworthiness when they are operated under stress. Many of these "senior citizens" of the airplane community—circa World War II—were built with enough strength to perform any maneuver the pilot could endure and then some, but with age, weaknesses may have developed.

Pilots purchasing old airplanes, either civilian or ex-military, or amateur built aircraft (new or old), should make sure, before buying them for acrobatic purposes, that (1) they were designed and built to perform the maneuvers the purchaser intends to perform, and (2) they are presently in good enough condition to be flown in such a manner. The latter consideration must continue after purchase, of course, and can only be assured by frequent, thorough inspections and prompt attention if flaws are found.

Closer attention to the condition of the quick-release door-opening mechanism on a *Citabria* might have saved the life of a young aerobatic pilot in Oregon in 1975. After the G-load limits were inadvertently exceeded in flight, the right wing struts buckled, leading to failure of the wing spar and finally separation of the right wing from the aircraft. When the parachute-equipped pilot and passenger attempted to bail out they were unable to activate the quick-release on the door. The passenger eventually managed to exit through a broken section of the windshield but the pilot could not make it in time and perished in the crash.

Checking the door release should be a high priority item on the pre-flight inspection list, according to Fred Cailey, a mechanic with considerable experience on acrobatic airplanes and chairman of the Technical Safety Committee of the International Aerobatic Club. Cailey keeps a record of malfunctions in acrobatic airplanes and reports them regularly in the Club's magazine, "Sport Aerobatics". Cailey

gathers his material from a variety of sources, including FAA service difficulty reports, NTSB accident reports, manufacturer's service letters and various manuals. Incidentally, the maintenance manual is something Cailey feels aerobatic pilots should *own*, for each airplane they fly.

In addition to regularly scheduled maintenance and the daily (or oftener) preflight inspection, pilots are urged to consult with their mechanics any time they feel the airplane may have been inadvertently flown above the G-load limits for which it is certificated. Damage, invisible to the untrained eye, may make the next acrobatic flight unsafe.

Preflight inspection items of special interest to aerobatic pilots, over and above the routine checklist used for normal flying, include the following: (Certain items vary from one airplane to the next and pilots should always follow the recommendation of the manufacturer for production airplanes.)

- **Seats.** Check where seat attaches to the floor, and also where back joins seat bottom.
- **Safety belts and harnesses.** Scrutinize carefully; worn or weakened bolt or buckle might hold up in normal flight but could fail when called on to support several times the weight of the pilot in inverted flight.
- **Windows.** Check all windows for security, paying special attention to windshields and the skylight that some acrobatic airplanes have. A windshield with a seemingly harmless small, stop-drilled crack could give way under the G-stresses imposed by acrobatics, either incapacitating the pilot or rendering the airplane uncontrollable. *Note:* an airplane minus windshield or skylight assumes quite different flight characteristics. Pilots should learn about these along with other emergency procedures.
- **Emergency door release.** Check airplane handbook for instructions for individual models. A balky door—no more than a nuisance in normal use—could spell the difference between life and death if a parachute-equipped pilot was unable to release it for a hasty exit in an emergency.
- **Fuel caps and oil filler caps.** Make sure they are tight.
- **Battery.** See that it is secure in whatever container is provided. (Some acrobatic airplanes have double battery cases.)
- **Struts and wires** (wing and tail). These need to be scrutinized frequently since they undergo heavy stress in acrobatic flight. Pilots should be alert for wires that "sing" in flight and have them checked by a mechanic.
- **Fabric.** All surfaces should be examined carefully and often. A small flaw can become a large problem very quickly under the stress of aerobatics.
- **Propellers.** Metal props should receive the usual inspection for nicks and cracks. If the prop is wood, the bolts need frequent torque-checking. (Some mehanics recommend torque checks every ten hours.

There are many misconceptions regarding the stress on the aircraft during acrobatic flight. For example, many pilots think that if the aircraft is lightly loaded, less stress is imposed on the structure, and maneuvers may be performed at higher air speeds. This is not always true. Certain loads are generated as a result of aerodynamic reactions. For example, a deflected aileron often imposes a twisting force on the wing. This force increases with increased airspeed and has no relation to the aircraft weight.

Some pilots feel that if the airplane is light they can safely fly it at higher G's than are authorized for a fully loaded aircraft. *Not so.* It is *never* safe to go over the G-limits, or to fly "just a little bit over" the redline speed, even in an acrobatic airplane. Aircraft should be flown *within* the operating limitations, whether those limits are found in an approved airplane flight manual, or in placards in the airplane. Operating limitations for acrobatic airplanes always include the approved maneuvers for that particular airplane as well as entry speeds for each maneuver. These must be observed, to prevent the aircraft from being overstressed in the course of the maneuver.

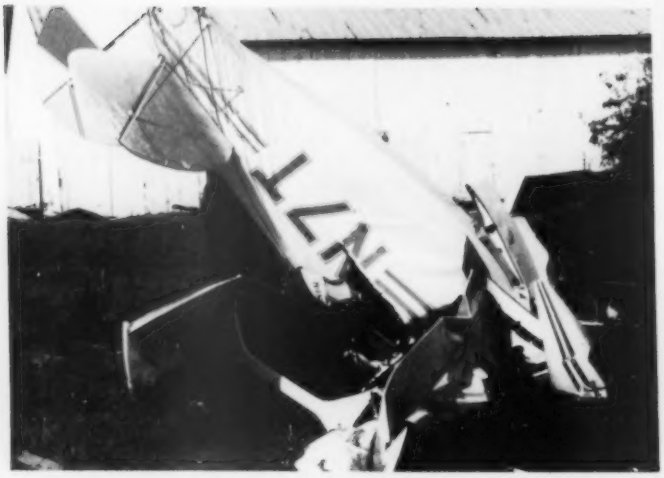
On the subject of manuals, Larry Nelson of Bellanca Aircraft Corp., manufacturer of Citabria and Decathlon acrobatic airplanes, cautions that if an airplane has an approved flight manual you should never use a borrowed manual, even from a seemingly similar model, because each individual manual is specific for a specifically equipped airplane. If a manual is lost, request a duplicate from the manufacturer.

Another extremely important factor in aerobatic safety is utilizing all the safety gear available, starting with good parachutes, properly packed. Regulations require that if passengers (including students) are carried in an acrobatic flight, all occupants must wear parachutes. The International Aerobatic Club (IAC) goes farther, requiring all pilots to wear parachutes during competition, solo or not. Champion aerobatic pilot Bob Heuer, an airline pilot and founder of the IAC, advises pilots to decide in advance under what conditions they will bail out (Fire? A stubborn flat spin? Wing separation?) and then when the time comes to go, *go*—without further soul-searching.

The use of safety belts and harnesses is another subject that assumes added significance in aerobatics. Most of the aerobatic professionals favor dual (two) safety belts for added security, and Verne Jobst, President of the IAC, cites a most convincing reason. Early in his aerobatic career he had a safety belt fail during inverted flight. Fortunately the airplane was enclosed and he managed to retain control.

Not so lucky was "Speed" Holman, for whom Holman Field, the St. Paul Airport, is named. Holman, an air racer of considerable renown and also an airline pilot,

Verne Jobst, (lower photo) veteran aerobatic pilot and president of the International Aerobatic Club, urges the use of all available safety gear, including parachutes and dual safety belts. Pilot in center photo is geared up for an attempt at an "inverted flight" record. Clearly visible is quick-release mechanism for door, which has been temporarily removed.



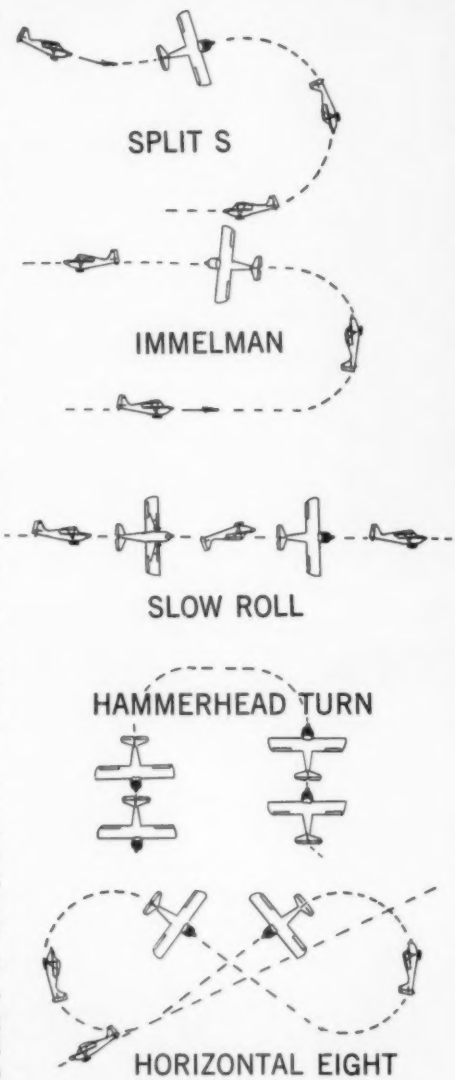
Knowing when to jump is important. Pilot parachuted safely before the above crash, which was attributed to an excessively aft C.G.

Accelerometer (G-meter), shown above during slow roll, registers current G-forces and also highest positive and negative G's of the flight.

was performing in Omaha in May 1931 to amuse some spectators who had grown restless between acts of an air show. One of his favorite maneuvers was to dive his open-cockpit Laird *Racer* steeply from about 2,500 feet, then level off, roll over, and make an inverted pass about 20 feet above the runway. The act was quite a crowd pleaser, and he had done it many times before, but on this particular day as he made his low inverted pass he was observed to be hanging from the cockpit, struggling with the controls above him. Then the airplane plunged to the ground in a burst of flames and he was killed instantly. Speed Holman, known for meticulous preflight inspections, had overlooked one seemingly small item: a rust-worn safety belt buckle that chose an inopportune time to fail.

A totally different aspect of preflight preparation is the special subject of Dr. William McCullough of Levelland, Texas, an aerobatic pilot who is head of the Safety Program for the IAC and a recognized expert in medical and psychological aspects of aerobatic flying. Dr. McCullough recommends against pilots flying for any reason save one: *personal fulfillment*. Above all, never fly to prove anything to anybody, or when you are tired, upset, distraught or mad. "If you're mad at your wife," says Dr. McCullough with a twinkle, "it's okay to shoot her, but *don't go flying*."

In spite of McCullough's warning, accident records show that some pilots do attempt acrobatic maneuvers to "prove something"—to others or to themselves. There were quite a few of this type of accident among the 105 studied by the National Transportation Safety Board in a report that covered a three year period (1972-74). Some of the pilots were killed doing "stunts" over the homes of relatives or girlfriends or showing off for passengers. At least eight pilots had fortified themselves with alcohol or drugs before takeoff, and while the flights were classed as "aerobatic" in many cases neither pilot nor aircraft were qualified for aerobatic flight. In one accident the pilot had a few drinks and then took four passengers and a dog up in a four-place, normal category airplane and subsequently crashed attempting aerobatic maneuvers. All the people—and the dog—were killed.



According to Dr. McCullough, it is very important that pilots be in good condition—flying aerobatics is physically quite strenuous, often harder on human beings than on airplanes. (Personal gyros are apt to tumble before gyro instruments and instant vertigo is not uncommon.) Physical age does not appear to be as serious a factor as current physical condition.

The aerobatic pilot must get used to flying while affected by both positive and negative "gravity forces" (G-forces), and learn the danger signals of impending incapacitation from each type of force.

When a person is standing (or sitting or lying) still, the gravity force acting on his body is equivalent to his own weight, or one "G" positive. In a 60-degree coordinated level turn he has approximately two G's (positive) acting on him. (Since this is the steepest turn approved for normal flying, many pilots never experience more than two G's before they begin flying aerobatics.) Positive G's push the blood away from the head and upper body, toward the feet.

If a person stands on his head, or hangs upside down from a trapeze bar (or from an airplane seat belt) one *negative* G-force is affecting the body. In a negative G the blood is pushed toward the head, away from the feet.

Aerobatic maneuvers subject the pilot to both positive and negative G-forces of varying degrees. (Bear in mind that to be fully acrobatic an airplane must be stressed for at least six G's positive and three G's negative, and some are stressed for more.) With practice most pilots can build up their tolerance for G-forces. The generally ac-

cepted procedure is to start easy and work up.

IMPORTANT: *The degree of bodily stress is controlled not only by the strength of the G-force, but also by the length of time it is experienced.* For example, being subject to two positive G's for 13 minutes may be as harmful as a five-G force for half a minute. The length of time a pilot has been performing is often noted as a factor in aerobatic mishaps.

The worst G-effect of all is from a prolonged negative force followed by a sudden strong positive force, such as the "vertical eight" when it is entered from the inverted position with the upper loop an outside one and the lower loop an inside one. It is the physical stress on the pilot that makes this one of the more difficult aerobatic maneuvers.

Most acrobatic airplanes are equipped with an accelerometer, or G-meter, with three needles. One tells how many G's (positive or negative) are acting on an aircraft at any given instant. A second needle records the highest positive G-force experienced during the flight, and the third shows the strongest negative G-force of the flight. Needles can be set back to zero at the end of the flight.

For the average person, being subject to two or three G's makes you feel you are being firmly pushed down in your seat. Your hands and feet feel heavy if you try to move. At four G's your cheeks feel like they are sagging, and if the stress is prolonged you may begin to "grey-out", losing vision, but remaining conscious. Loss of consciousness could follow.

Negative G's are harder on persons (and airplanes) than positive forces. At two or three negative G's your face feels full and your head may throb or begin to ache. Your body is pushing on the safety belt and harness. At four negative G's you may begin to experience a "redout" from the blood pushing into your head and eyes. It is not unusual for pilots who have just experienced a heavy negative G-force to have bloodshot eyes, suggesting an alcoholic hangover.

Positive G-force effect on pilots can sometimes be minimized by using the "valsalva maneuver" in which the abdominal and pelvic muscles are contracted strongly (like a grunt) which slows the rush of blood through the body.

Dr. McCullough suggests that you should *not* try to fly aerobatics or even work on your airplane unless you are feeling alert and physically well. Never fly when you are tired; hung over; getting over a cold; taking tranquilizers or drugs; suffering from orthopedic problems; when hungry (candy or coke does *not* take the place of food) or out of condition. Also, heavy smoking is not conducive to the good condition demanded by aerobatics.

Precision flying demands all you have to give—every minute of every maneuver. Acrobatic airplanes are non-forgiving. ■

BRIEFS

EXIT THE TRIANGLE. The triangular pattern—used by generations of pilots to signal radio failure—has gone by the wayside, bowing to more sophisticated and efficient methods such as a transponder squawking 7700 for one minute, then 7600 for 15 minutes, repeatedly. The old system called for flying a left triangle if both transmitter and receiver were inoperative and a right pattern if only the transmitter was not working. Such a pattern is nearly impossible to detect on present-day radar; and in IFR conditions an airplane flying a triangle could dangerously reduce separation from other traffic. FAA believes pilots facing emergencies might make better use of their time and fuel by investigating other solutions to their problems. (FAR 91.127 details procedures for radio failure during IFR operations.)

OVER THE WAVES. Pilots who plan to make flights into "oceanic airspace" under United States air traffic control jurisdiction, will be interested in a new FAA Advisory Circular that describes the special considerations necessary for such a flight. The United States provides air traffic service in certain areas of the Atlantic Ocean, Pacific Ocean, Gulf of Mexico and the Carribean Sea. Flights operating in these specified areas are subject to special requirements, including IFR flight plans for flight between sunset and sunrise. Other special requirements have to do with flight planning, navcom equipment, position reporting, transponder operation, warning areas, reference documentation. The publication also includes a list of sources for obtaining additional information on the subject. "Flight Operations in Oceanic Airspace" (AC 90-E6) is free.

NO BOOMS. It is possible for aircraft to fly faster than the speed of sound without causing a sonic boom on the ground. This theory was demonstrated in recent FAA tests that showed that when wind and temperature information (available from routine sources) is carefully figured into the flight planning the booms can be avoided. During the tests, sonic boom monitoring and recording equipment was positioned on Coast Guard cutters off the coast of Maryland, Virginia and Delaware while aircraft passed over at 36,000 feet traveling at speeds between Mach 1.05 and Mach 1.2—as fast as 765 miles per hour. All eight test flights were boomless.

SMOKE SIGNALS AT OSHKOSH. Oshkosh-bound pilots of aircraft without radios take note: Red smoke on the airport means DO NOT LAND. The smoke signal (new this year) has been devised as a "temporarily closed" notification for those aircraft, and will be used occasionally during the Experimental Aircraft Association Fly-In July 30 through August 6. (To fly non-radio-equipped aircraft in to Whittman Field during the Fly-In, pilots must have in their possession waivers that have been obtained in advance from the Oshkosh Tower.) Smoke signals do not affect radio-equipped aircraft, which will continue to follow tower instructions. Note: Normal scheduled air carrier service will operate during the Fly-In.

Advisory Circulars mentioned in this column, unless otherwise noted, are available free from DOT/FAA Publications Section, TAD-433.1, Washington, D.C. 20590.

AIRPORT FINDER. Pilots who fly into grass strips often find the most difficult part of a flight is picking out the airport from among a myriad of other green fields in the area. To help solve this problem and others related to marking and lighting of sod strips, FAA is conducting tests at the National Aviation Facilities Experimental Center (NAFEC) in New Jersey. A 3,000 foot grass runway is being used to determine relative effectiveness of various styles of inexpensive markers and visual approach slope indicators. Pilots who helped in the tests by checking conspicuity during VFR approaches gave the above black-and-white pyramid (shown marked with Atlantic City designator) good marks as an airport identifier.

Taped Radar Returns Aid Search for Missing Aircraft

A newly developed technique that uses computer recorded radar data to trace the final moments of an aircraft flight is being credited with helping locate 15 missing aircraft in the first four months of 1977 and with saving at least one life.

The save involved a 17-year-old pilot who crashed in a remote mountain pass near Lake Tahoe, California in March. The radar information aided rescuers (who had estimated the crash site to be some 35 miles away) to zero in on the downed airplane and to get the surviving pilot out before a heavy snowstorm moved into the area.

The procedure for having radar data on aircraft targets recorded on tape where it can be retrieved in the form of a computer print-out was originally developed for testing the new computerized air traffic control system. The technique was extended two years ago to search and rescue use after personnel at the Denver Air Route Traffic Control Center recognized its potential in that area, and worked out procedures in cooperation with the Air Force Rescue Coordination Center at Scott AFB, Ill.

At present, special training is needed for the delicate task of tracing an aircraft flight path on the print-out to the point where it disappears from the radar screen. Currently 15 Air Route Traffic Control Centers have the proper equipment for the purpose. However, FAA expects that within the next two years the task can be simplified and a new computer technique developed so that all 20 Centers will have the capability of searching for missing aircraft by means of radar tape.

Centers Use Split Channels for High Altitude Aircraft

Pilots who operate at flight levels above 18,000 feet may be using 25 kHz spaced radio channels (three digits after the point) when communicating with en route traffic control center in the midwest this summer. Two high-altitude sectors began using the split channels in April. They are in Chicago and Kansas City Centers. Ten more high altitude sectors will be added by October in the Atlanta, Boston, Cleveland, Indianapolis, New York and Houston Centers. Starting next January the agency will assign additional 25-kHz spaced frequencies for high altitude use on a case-by-case basis where channel congestion warrants, using regular notification procedures such as NOTAMs and AIM.

Aircraft that use these high-altitude sectors—primarily airliners and high performance general aviation aircraft—will need 720 channel radios to enjoy maximum benefits from air traffic control services.

Scientific Publications

A new list of scientific and technical reports has been issued by FAA, describing some 101 documents on aircraft safety, airports, air traffic control, aviation medicine, communications, navigation, weather and miscellaneous other aviation-related subjects.

The list, which includes prices and instructions for ordering the reports from the National Technical Information Service in Springfield, Va., can be obtained by writing FAA APA-300, Washington, D.C. 20591.

Engine Review Scheduled

Are you having problems with your aircraft engine? Do you believe engine airworthiness standards are too high or not high enough? If you wish to see the rules changed, you may submit proposals for consideration at an FAA Aircraft Engine Regulatory Review Conference, scheduled for later this year. The Conference, part of the "1977 Aircraft Engine Regulatory Review Programs", will discuss numerous issues raised by aircraft engine manufacturers and others concerning the engine airworthiness standards in Part 33, and related powerplant installation requirements in Parts 23, 25, 27 and 29.

The public is invited to attend the Review Conference (no charge) and to submit proposals of their own. Review Programs are designed to obtain maximum public participation in aviation rulemaking. All proposals must be submitted by August 4, 1977, to FAA, AFS-910, Washington, D.C. 20591. Contact Mr. Adolfo O. Astorga (202) 755-8714 for further details.

The conference agenda will be distributed by October 3, 1977, to all persons who submitted a proposal and to others on request. The conference agenda will contain a compilation of the proposals submitted that were within the scope of the review, Conference dates and location, and detailed information on the scheduling of the proposals for discussion.

Student Pilot Advisory

Everything you always wanted to know about flight training is contained in FAA's "Student Pilot Guide" which is now available in an updated form. The booklet answers questions on medical and student pilot certificates; radio operator's permit; pilot training; written and flight test and sources of additional information.

"Student Pilot Guide" (AC-61-12H) may be purchased from Superintendent of Documents, U. S. GPO, Washington, D. C. 20402. Price is $1.50.

ATP Helicopter Guide

A new guide has been pubilshed by FAA to aid applicants and instructors in preparing for the flight test for the Airline Transport Pilot Certificate with a Rotorcraft Category and Helicopter Class Rating, under Part 61 of the FARs. The guide describes procedures and maneuvers relevant to the flight test, both for the certificate that is "limited to VFR" and for that which is "not limited to VFR." "Flight Test Guide, Airline Transport Pilot, Helicopter" (AC 61-82) is 80 cents from Superintendent of Documents, U.S. GPO, Washington, D.C. 20402.

• Simulator Time

Your publication is excellent and it is mandatory reading at our school. Perhaps you can clarify a point for us concerning the use of ground trainer time to meet the total time requirements of 200 hours for the instrument rating. Specifically, can 20 hours of ground trainer or simulator time be applied towards the total time requirement of 200 hours for the instrument rating?

Clark McCormack
Aviation Training Enterprises
Cleveland, Ohio

Yes. The "20 hours of instrument instruction by an authorized instructor in an instrument ground trainer acceptable to the Administrator" that is allowed under FAR 61.65(e)(2) may be applied toward the minimum total hours required of applicants for an instrument rating.

• VOR Voice Ident

Why can't all VOR stations use voice identification instead of the more commonly used Morse code system? Seems to me the increased safety factor would more than offset the small additional cost.

Vincent Buonanno
Staten Island, N.Y.

The "small additional cost" is not the only consideration in installing voice ident on VOR's (although it is not as inconsequential as it might appear, when you consider installation, maintenance, replacement parts, etc.) The big problem with voice ident is in "time sharing"—fitting it in with other voice broadcasts. On VOR's which transmit ATIS or transcribed weather, for example, voice ident could not be used often enough to be really useful. Morse code identification, on the other hand, is repeated eight or ten times a minute.

• The Wright Passenger

I always enjoy the information in your publication.

In the March issue (on page 2) General George Owen Squier is credited with being the first military passenger ever taken aloft by the Wrights. This I reject.

According to "The Wright Brothers" by Fred C. Kelly, a biography authorized by Orville Wright, on 9 September 1908 Orville Wright took his friend Lt. Frank P. Lahm for a ride. Four days later, on 12 September, Orville took Major George O. Squier for a nine minute, six second ride. I invite anyone who is interested to read this authentic account.

J. H. Meyer, Curator
Aviation Hall of Fame
Dayton, Ohio

• Grounded Instructor

I look forward to each publication of your magazine. It is excellent in all respects.

I am an open-heart surgery pilot. (I did not have a heart attack, only preventive surgery). As such, I have been grounded but am currently in the process of appeal. I hold certificates for CFI and CFII and have logged 22,000 hours plus—started flying in 1937.

My question: May I legally certify ground trainer time for my students in their logbooks?

W.T.B.
California

If you hold an unexpired *certified flight instructor rating you may certify ground trainer time for your students. You may also certify such time if you are a certificated instrument ground instructor.*

• Logging Reference

In recent issues of your magazine, you made reference to earlier letters and answers that had been published in the Forum, concerning the logging of pilot-in-command time by both student and instructor. I am a private pilot taking instrument training. I asked my instructor about this and he was not aware of a regulation to this effect, except when the student was checking out with an Examiner. Can you supply the regulation FAR reference covering this subject?

Adelaide R. Morris
Berkeley, Calif.

FAR 61.51(c)(2)(i) states "A private or commercial pilot may log as pilot-in-command time only that flight time during which he is the sole manipulator of the controls of an aircraft for which he is rated . . ." FAR 61.41(c)(2)(iii) states "A certificated flight instructor may log as pilot-in-command time all flight time during which he acts as a flight instructor."

• Student Logs

You have published a number of letters on logging pilot-in-command time and they have certainly served to clarify this matter. However, I have seen nothing about students logging pilot-in-command time. Most FAR references to student pilot time are termed "solo" flights. My question is, can a student pilot log his solo flight time (or any other time) as pilot-in-command time and therefore have it count as required pilot-in-command time for additional ratings?

John R. Kemble

Solo time, logged by a student when he is alone in the aircraft, can be totalled in with his pilot-in-command for purposes of qualifying for additional ratings. The student pilot should, however, keep his "solo" time separately until he gets his private certificate so that he can document that he has the required number to qualify for his certificate. Thereafter he may log solo time in the pilot-in-command column if he so chooses.

• Dual vs. PIC

Your publication is extremely useful and serves as a constant reference. My husband and I are both private pilots, and we file your magazine annually in a binder.

I am working on my commercial rating (then on to an instrument, flight instructor, etc.) and I have a question. While taking dual instruction can I log pilot-in-command time when I am the sole manipulator of the controls and also log it under dual received? My instructor believes I should log it in the dual column only.

Dolores Jewett
Geneva, Ohio

FAA GENERAL AVIATION NEWS welcomes comments from our readers. No anonymous letters will be used, but names will be withheld on request. Address: FAA GENERAL AVIATION NEWS, AFS-807, Washington, D.C. 20591.

You may log as pilot-in-command any flight time during which you are the sole manipulator of the controls of an aircraft for which you are rated. You may also log the entire flight period as flight instruction received.

• Private Airstrips

In your April, 1977 article "Restless Runways" you implied that "unregulated" airports generally lack in suitable runway facilities. I would like to state that in my six short years of flying I have found that most private airstrip owners take considerable pride in their airstrips, and maintain them at as good or better standards than "certified" facilities, and at a mere fraction of the cost.

Earl F. Tuggle, Sr.
Tampa, Florida

It is true that most *privately owned or "unregulated" airports are well maintained. Nevertheless, pilots need to be alert for exceptions which include airports that are abandoned; runways that are usable at all times except after a prolonged rainy season; seasonal airports that are only maintained during a particular busy period of the year, or the occasional airport that is simply neglected. The rules (and most insurance companies) hold that the pilot is responsible for seeing that the place he lands his airplane is a suitable one.*

INSTRUMENT CORNER

• To Hold or Not To Hold

Please clear up a point concerning an instrument approach that shows a holding pattern in lieu of a procedure turn. There is a difference of opinion here concerning the proper procedure to follow when approaching from a fix that is not an initial approach fix ('NoPT" *not* indicated on chart). We all agree that the appropriate holding pattern entry should be executed. Then some say that if you are in a position for final approach, just go ahead and do it. Others feel that at least one turn in holding must be made before commencing the final approach. Who's right?

Name withheld
Burns Flat, Okla.

The holding pattern in this case is a prescribed type of procedure turn, allowing an aircraft to reverse direction or otherwise maneuver to become established on an inbound track to the final approach fix.

The pilot should make an initial crossing of the fix, execute a holding pattern entry, and return to the fix on the prescribed inbound course. If cleared for the approach before or during the holding pattern entry, prior to recrossing the holding fix, and if the aircraft is at the prescribed altitude, additional circuits of the holding pattern are not necessary or expected by ATC. If the pilot elects to make additional circuits to lose excessive altitude or to become better established on the inbound course, he must advise ATC when he receives his approach clearance.

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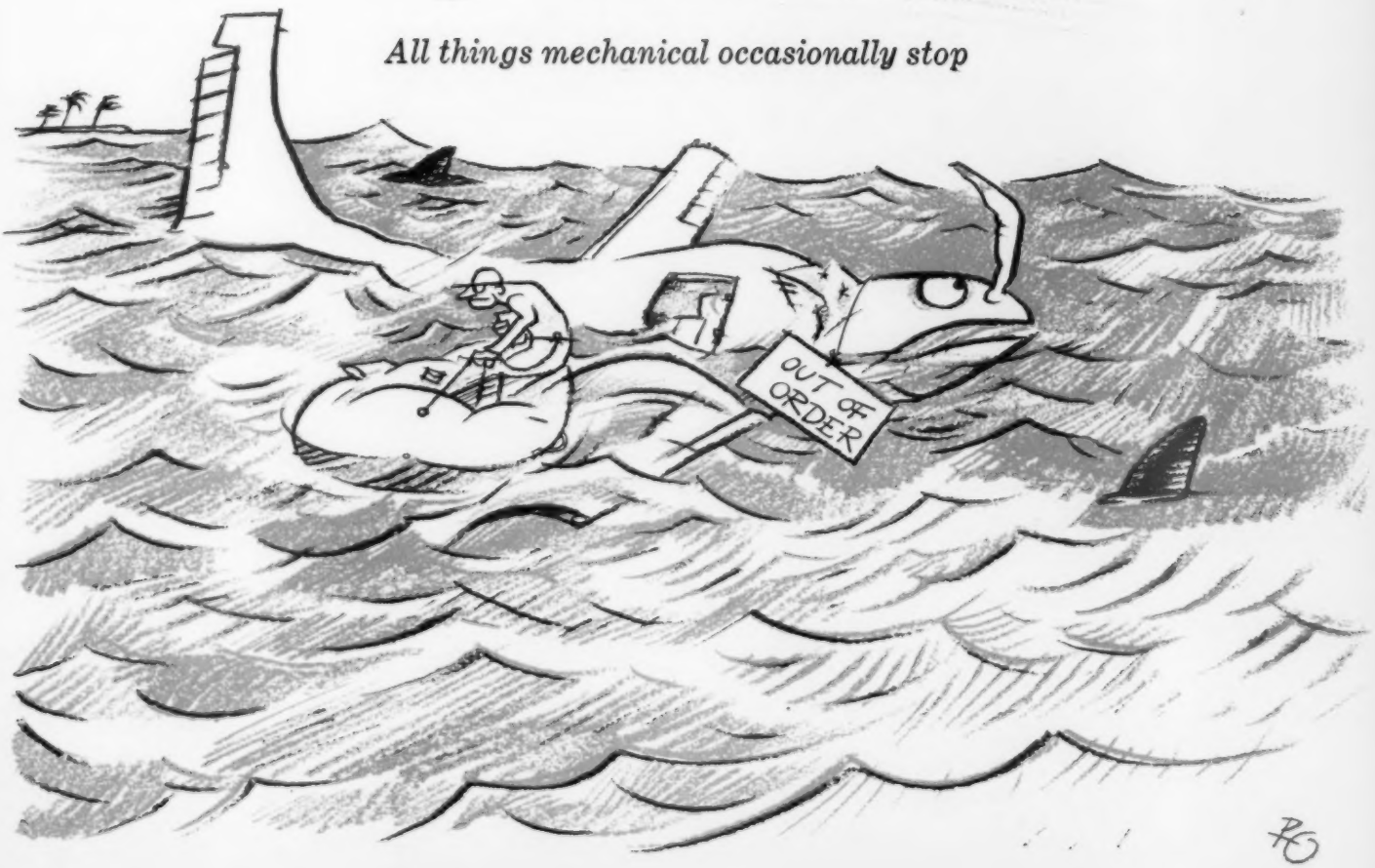

Be prepared to cope with a power drop